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Reasons for Low Percentage Contribution of Women in Science and Technology and Recommendations

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ABSTRACT

Science and technology is one of the major fields in which percentage of women involvement has always been low in the third world nations. If we really want to let women empower science and technology then we must look at the root cause of why the graph of women participation is not rising? Some of the root causes that are responsible for 3rd world women's backwardness in science are:

- 1) Lack of education in most of the 3rd world countries e.g. Pakistan, India etc
- 2) Early marriages of young girls under backward customs of certain societies
- 3) Lack of involvement of women in formulation of governmental policies and laws
- 4) Women who get highly qualified and luckily get access to universities to proceed further education when get married, come under family pressures and are forced to leave their education and to not practice what they have learnt.
- 5) Unfavorable conditions for women to work and contribute to scientific society due to issues faced like sexual harassment at work places
- 6) Cultural Values, poverty, lack of role models and government apathetic behavior towards women empowerment, lack of decision making power, limited mobility are some other reasons behind the insignificant number of women in science and technology.

There are solutions to these problems for instance:

- Creating special resources for women education and opening schools and colleges in even small districts and villages and other than teaching conventional subjects, subjects like gender studies, advanced sciences etc should be included right away from small levels

- Working against the violation of rights of marriage by condemning early age marriages
- Inculcating into women strong leadership abilities so that they could be able to decide for their life and could get actively involved in politics so that they could get a certain power to work for the society in general and for deprived women of the society in specific
- Educating literate women on how to practice their field of specialty and yet to manage family and children. Enhancing their communication and working skills and a need to understand their value in science and technology
- Last but not the least, regarding sexual harassment, governments must be forced to apply lawfully code of conduct at all work places against sexual harassment issues. Women must also be empowered enough to deal with such matters efficiently by conducting workshops and seminars for occupational women of the society.

INTRODUCTION

Science and technology is the order of the day. Present world development and progress is unachievable without advancements in these disciplines. The contribution of women in science has always been un-notified and somewhat taken as non-serious due to stereotypical thinking in many parts of the world, especially in the 3rd world nations. Empowerment of women in science and technology is not an impossible task because women have same level of intellect, leadership abilities and potential as that of men. Keeping in mind the abilities of women, we see that there are many minor and major problems present that are creating hindrances in the way of a woman to start her career in science and become an asset for the society. Going into the deep analysis of these problems, it becomes apparent that the issues concerned have their roots in the discriminating behavior of society towards female part of it which are not faced by males the same way.

Some of the main issues like early age marriages of young girls, lack of awareness and education, sexual harassments, lack of women empowerment in governmental policies and many others have directly or indirectly effected the percentage of women's contribution in science and technology. The backward approach that women have nothing or little to do with science and related fields

can be reverted if these issues are resolved, and resolving these issues need legislative steps to bring about a positive change in the governmental policies. This will result in conditions favorable for women to actively take part in science and technology.

Here, the focal point of the research is on women of the third world i.e. Pakistan where their role in science and technology is not as significant as in the developed nations of the world because of the socially sanctioned gender discriminations and violence against women.

MAIN ISSUES RELATED TO LACK OF SIGNIFICANT WOMEN CONTRIBUTION IN SCIENCE AND TECHNOLOGY

Most of the issues that are creating hindrances in women's contribution in science and technology are social rather than scientific. Some of the highlighted issues are:

- 1) Lack of access to education
- 2) Early age marriages
- 3) Lack of decision making power
- 4) Limited mobility
- 5) Lack of involvement of women in formulation of governmental policies and laws
- 6) Confrontation with sexual harassment at academic institutes and work places
- 7) Putting away careers by well educated women under family pressures
- 8) Poverty
- 9) Lack of role models

All the above mentioned issues are explained as follows:

1) Lack of access to education:

In many 3rd world nations like Pakistan, India, Bangladesh etc educating a woman is not considered as important as educating a man. Though the trends are changing in big cities but small towns and villages are still practicing traditional norms and values which are discriminating towards women and limit women's accessibility to education, information, resource, and employment. The typical role of women in society is "household wife" and "a good mother" who should know how to keep her family and her husband happy rather than contributing towards the society and towards her own empowerment.

According to 2005-2006 statistics of Pakistan by the ministry of education only 198, 208 women have got education on degree level. Lack of higher educational institutes in small towns and villages adds to the hurdles of women in accessing higher education. Even if a girl or woman wants to go beyond primary level of education, then the lack of facilities becomes a major hurdle because for higher education she must leave her home and live without the supervision of family which is not tolerated by the family because it will lead to independency and empowerment of women. Moreover, the high cost of education also poses a greater challenge to women education. Majority of the people do not want to invest in female child education because there is a common perception in the society that daughters are disowned by considering that when they get married they go into the control of their family therefore it is foolish to spend on daughters. In Pashto language there is a famous saying that "women is like a dunk cake of others wall". How can a society, who consider women a dunk cake, invest in women education? For equal access to education, information and resources recognition of women as equal human beings is the first step. Without gender equality and women empowerment it is impossible for women to contribute effectively in science and society.

Women in Pakistan constitute a total of about 49% of the population. Even if 20-30% of them get higher education and enter into the mainstream science then can contribute a major percentage in this field, but as more than 70% are lacking the basic education so their input in science and technology becomes a question. Due to fixed mindset, these women are considered to be involved in looking after their family and taking care of their children.

2) Early marriages:

There is a clear evidence of the prevalence of different harmful practices such as honor killing and early marriages. The roots of these harmful practices against women date back to the control of women sexuality by men. Early age marriages are an issue that has directly affected the significant percentage of women contribution in science. Early marriages have devastating effects on the lives of women; they not only pose challenges to women health but also disconnect women from the mainstream i.e., education, resources, decision making, and information. Due to early marriages, a woman comes under the

burden of family responsibilities at a small age; she has to keep her family happy, obey them, and has to spend all her time in household activities with no time and space left for study and career development. The concept of early age marriages lays behind it the backward approach of the society that women are only meant to bear children and looking after the family and has nothing important to do with a bright career in life. Under such a scenario, it is least expected that the family of that girl/woman has ever thought about indulging the lady into the field of science and technology.

In Pakistani society, the career of woman is considered as a "model wife" and "model mother". Raising "good children" is national duty of women and most of the time investments done in women development aims to promote good mother-ship among women. Even the education policy, of the State mentions the importance of education for women in terms of nurturing good mothers.

One of the examples of how early marriages limit women's access to education is of Mrs. Amna Haroon from a village of District Swabi who got married at the age of 15. At the time of marriage she was studying in School but she had to leave School for marriage. She was promised by her in-laws they will allow her to study after marriage but after marriage they didn't allow her to study because for them it was important for her to manage household activities and take care of her husband instead of developing an academic career.

Another example is of Mrs. Nida Mushtaq; an intelligent girl who got married when she was doing her Graduation in Biotechnology, though she was allowed by her husband to complete her graduation but was not allowed to apply for a Master or a PhD so that she can continue her carrier as a scientist.

These are just two examples out of the thousands of cases which occur in Pakistan. Early marriages lag behind women from education and Science. Though, Pakistan is a developing country but women of Pakistan are as intelligent as women of other nations. The only difference is that the socially sanctioned gender issues hinder women from accessing education, information and technology.

3) Lack of involvement of women in formulation of governmental policies and laws

The Parliament and Ministries of Pakistan have a majority of males who have the typical patriarchal thinking which limits women mobility and access to education, information, employment, health care, justice, and other social services. This is very obvious from the discriminatory laws against women present in the country.

The presence of a small number of women in law making institutions i.e. Parliament and Ministries lead to laws and policies which are not gender mainstreamed and do not address gender issues. The lack of meaningful participation of women in policy making is another major issue which leads to gender biased programs and policies. According to Suzanne E. Estler there are several intertwined processes that divert women from leadership positions. One set of these processes relates to the woman's response to societal role definitions that define women as helpers, nurturant, warm, and human, but not as leaders. This results in a double bind for the capable woman whereby intellectual success does not match society's expectations for her (Estler Suzanne E, 1975).

4) Sexual harassment at institutional and work places:

Sexual harassment is an important issue that is faced by almost every woman whether standing on a bus stop or working in a reputable multinational company. Sexual harassment at work places has negative impact on performance of women not only in social sector but also field of science. Fear of sexual harassment during research and employment limits the space for women to contribute towards science and development of a society. Sexual harassment is an expected but unwanted issue at workplaces, so parents don't allow their daughters to work in men dominating areas like Research Labs, Industries and Business markets. In many cases, sexual harassment is a major cause for women to leave good jobs. It is a known fact that industries are the main practical fields in many sciences like biotechnology, pharmaceuticals etc but unfortunately in third world countries the socially sanctioned issues limits women accessibility to these fields. Due to this, even a well educated woman with lots of talent finds it difficult to work in an industry even as a research scientist, just because of the fear of being harassed.

The two main reasons why women cannot stop this unwanted act of others are:

- a) Lack of proper code of conduct at work places
- b) Lack of capacity in women to be well aware of this issue and knowledge on how to tackle with it.

Due to absence of proper code of conducts at work places regarding sexual harassment, an effected woman also cannot take a proper action against it. So, instead of getting enough confidence to tackle with these issues, she prefers to leave her present position and either finds a new job or sits at home. Harassment is associated with depression, suicide attempts, and a desire to switch specialties (Frank E, Brogan D & Schiffman M, 1998). Also, due to lack of capacity of an average woman to tackle with these issues by getting proper knowledge about it and to be well aware of this issue, a woman is prone to sexual harassment, which can affect her career.

5) Putting away careers by well educated women under family pressures:

Only very few percentages of women in 3rd world continue their education and reach to the levels of doctorate and post-docs and when these women get married and build up a family unit, they are unable to pay equal attention to their career in science. This can be due to various possible reasons like:-

- a. They are unable to manage time and cannot pay full attention to their careers
- b. Sometimes, they cannot withstand family pressures thus leave their jobs.

Women with brilliant academic records and bright future prospects in science and technology, when leave their posts/jobs, is the biggest loss to the scientific community faces because, already, contribution of women in science is low. In societies like that of Pakistan and India where the primary responsibility of women is to work in their homes and to look after their children, contribution in science through research and jobs become hard. They not only have to manage inside home but also have to pay full concentration outside homes at their workplaces. Women who have become physicists report that one of the major obstacles in their path on the way was the expectation that they would also be the primary caregiver for their children (Ivie, Czujko, & Stowe, 2002). Time management becomes a task unachievable for them and as a

result they have to leave one thing for the other or work in a manner leading to less creativity and productivity.

The marriages of academic women were less stable, showing higher divorce rates for academic women than for academic men. Various studies also showed that academic women reported less satisfaction with their marriages than academic men. Needless to say, the experiences of married academic women were not the same as those of married academic men (Noordenbos G, 1992). The main reasons why sometimes it gets difficult for a woman to manage her time are:

- 1) Reproduction responsibility
- 2) Big family size due to lack of proper family planning
- 3) Lack of cooperation from her husband and/or other family members.

According to H. Etzkowitz et al, marriage and children negatively impact women's careers in academic science at three key times: having a child during graduate school, marriage at the point of seeking a job, and pregnancy prior to tenure (Etzkowitz H et al, 1994).

6) Lack of decision making power and limited mobility:

In the male dominating societies where gender inequality is highly prevailing, women are not given enough space to choose a life of their own choice. This results in more control of others on their life, than their own-selves. This results in lack of self confidence and low self esteem of a woman, who is unable to decide for her life by her own-self. The roots of this problem lie in the different gender experiences of boys and girls. As young girls and women, females are socialized to seek help and be help givers rather than to be self-reliant or to function autonomously or competitively, as are boys. Girls are encouraged to be good students in-so-far as they expect to be given a task, complete it well, and then receive a reward from an authority figure (Etzkowitz H et al, 1994).

Also, limited mobility of women has resulted in their less • contribution in science and technology. Due to restricted mobility, a woman cannot have open access to work and education. Many women are not allowed to work even if they are qualified enough to do so. Some have no access to higher education

which keeps them away to. enter into the research work, which is the soul of science and technology.

7) Poverty:

Poverty worsens a woman's condition as far as her education and career are concerned. Because, a poor family will never like to spend a single penny on daughter's education, rather it would like to spend more on son's education/work due to the mindset that males are superior to females.

RECOMMENDATIONS TO SOLVE THE ABOVE MENTIONED ISSUES:

It is not unusual to hear 'men and women are different', and that's just a fact of life to explain the current situation for women in society. It seems clear from the literature that whatever biological differences there are between, men and women, there is very little difference in scientific or mathematical ability, and certainly not enough to explain the under-representation of women in STEM (science, technology, engineering and mathematics) careers (Blickenstaff J.C, 2005). Cronin and Roger (1999) point out that initiatives to bring women and science together focus on one of three areas: attracting women to science, supporting women already in science, or changing science to be more inclusive of women. Many non-governmental organizations in Pakistan are working towards solving some of the above mentioned problems. Other than NGOs, government should also take keen interest in solving the issues which are creating hindrances in a woman's way to enter into the field of science and technology because without the active contribution of women in science and technology, it would be difficult to excel in these fields. Some of the proposed and already taken steps in this regard are mentioned as follows:

1) Education:

Mindsets of people can only be changed through proper education and awareness. Educating one generation will turn out to be fruitful for the next. Opening not only primary level schools, but also colleges in small towns and villages will show a positive impact in this regard. Also enhancing teaching capabilities of teachers is mandatory so that modern text could be taught to students in an effective manner. For this purpose the third world governments should work in collaboration with each other in terms of trainings, capacity

buildings and student-teacher exchange programs on primary and college levels. Also right away from the college level, the students must be given all the basic information regarding scholarships in higher education , in this way capacity will be build for those who want to go beyond college levels. Because most of the time, females especially in the remote areas of the country don't have access to information, so this will be fruitful to them. Also, number of scholarship specifically open to women must be increased.

2) Early age marriages:

As far as early age marriages are concerned, many NGOs are -already working in the nations with these issues like in Pakistan. Proper awareness of the parents and society is very crucial to solve this issue. Realizing that women are equally important in development of a nation as that of men is a task that is not unachievable. She has equal rights as that of men to live a life of her choice and to build up a bright future for herself. Realizing that early age marriages are threatening to the health of a young girl and that her life can have many other purposes other than bearing children can be inculcated into people minds through workshops, seminars and performing arts.

Mass communication through television and radio programs can be a vey effective way to reach people from small villages to big cities. Also, formulation of rules and laws condemning this cruel act and considering it as an illegal matter will be helpful as well. In this issue, government seriousness towards the matter cannot be overlooked. All the actions taken against early marriages will help sensitizing society about the demerits of early marriages. This will also be helpful raising awareness about women rights and promotion of right based approach in society.

3) Lack of involvement of women in formulation of governmental policies and laws:

Ensuring meaningful participation of women in policy making instead of tokenism is the demand of the day. The participation of women in governmental policies will pave way to deal with many social issues which an average woman faces and which affects her career. For instance, early marriages and sexual harassment are two out of many issues which can be resolved through proper rules and laws. The active role of few women in politics can turn out to be very

useful for others. Raising voice against social injustices and gender inequalities, discouraging harmful social practices through community level and policy level intervention is mandatory. The role of women here cannot be neglected.

4) Sexual harassment at institutional and work places:

In many nations of the world code of conducts are followed at all work places. This code of conduct is concerned sexual harassment issue. Due to this, the ratio of harassments declined over there. The same way, in the third world nations should also go for it, if haven't so far. Following this conduct will provide a safe and more favorable environment for women to work and show their abilities in their respective fields. In the industries, the ratio of women workers will certainly increase. The exposure to new techniques and business works will give women a way to express themselves more and become a useful human resource in the field of science. Also, capacity building sessions for women must be conducted that address the issue of sexual harassment. Making women aware of this issue and how to tackle with it is the key to bring more confidence in females so that they get self-sufficient to work with comfort.

5) Capacity building sessions for working women to manage time and family

with career and maternity paid leaves:

Time management is the key to handle different tasks together. Most of the women who are career oriented and have to look after their family at the same time , must be provided with capacity building sessions/ workshops to teach them how to manage between the two. How to divide time for different activities of life like family, job, entertainment, self grooming etc is mandatory to know so that under time constraints no woman should quit her career. These sessions can be conducted by an independent body or also by the business firms who hire female staff.

Sometimes, working women who are married also are under great pressure when the firms etc where they are working do not have regulations addressing maternity paid leaves to female staff when required. Rules regarding maternity paid leaves must be introduced at work places through governmental policies. These paid leaves must be given value as right of a woman. This

helping hand at work places will certainly add to the ratio of women in science and technology and other fields as well.

6) Poverty:

People with a monthly income less than specific set amount must be given additional increments in the form of free education to their children by government to enhance education level among poor. In Pakistan, government addressed this issue by providing free books and uniforms to poor students. But, in order to ensure the education of girls from poor families, additional steps needs to be taken. This can be done by giving special incentives to those poor families who allow their female family members to join schools and colleges to get education.

7) Building up of role models:

One reason for low percentage of women in science and technology in third world nations is the lack of role models. Literature regarding women as students cites the absence of women faculty role models as a factor in the discouragement of women students (Estler Suzanne E, 1975). This deficiency can be either due to already insignificant ratio of women in this field or due to low/no encouragement of women already working in science. A low proportion of women in a discipline

probably sends a message to girls that the discipline is unattractive to women, and they should avoid it too (Blickenstaff J.C, 2005). Giving them importance through awards, prizes, highlighting them through media and other means of mass communication and appreciating their works will create role models in the society. This will encourage other young girls and women to follow the foot steps of those role models and make a bright future in the science and technology.

There are many institutes in the 3rd world, which are imparting higher education in science and technology and are involved in great research works. These institutes can also collaborate with each other to encourage and recognize women in science and technology. **CONCLUSION**

Ratio of women in science is low not because women are less capable than men, but because they do not have same facilities as given to men in society. Most of the third world nations have male-dominating societies. Under

such kind of circumstances, women suffer the most. They don't have proper approach to education, even if they get higher education, they have pressure to do dual jobs of looking after family and excelling in career. Active contribution of women as human resource in science and technology can speed up the development of science because women constitute a major percentage of human population. It is time to spread awareness so that stereotypical thinking regarding women in science could be abolished.

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ملخص

تعتبر العلوم والتكنولوجيا إحدى الميادين الرئيسية التي ظلت نسبة ما تشارك به المرأة فيها متدنياً لدى شعوب العالم الثالث. فإذا أردنا حقيقة أن تتمكن المرأة من العلوم والتكنولوجيا لا بد أن نتدبر السبب الأساسي لعدم تصاعد الرسم البياني لمشاركة المرأة. وأن بعض الأسباب الأساسية المسؤولة عن تأخر المرأة في العالم الثالث في مجال العلوم هي:

- ١- عدم وجود التعليم في معظم بلدان العالم الثالث مثل باكستان والهند... الخ.
- ٢- الزواج المبكر للفتيات بحسب العادات المتخلفة لبعض المجتمعات.
- ٣- عدم مشاركة المرأة في صياغة السياسات الحكومية وقوانينها.
- ٤- النساء اللاتي يحصلن على مؤهلات عليا ويصلن بفعل الحظ إلى الجامعات من أجل مزيد من التعلم يتعرضن عند زواجهن لضغوط الأسر ويرغمن على ترك دراستهن وعدم تطبيق ما قد تعلمنه.
- ٥- عدم وجود ظروف ملائمة لتمكين المرأة من العمل والمساهمة في المجتمع العلمي بسبب ما يواجهن من أمور كالتحرش الجنسي في مواقع العمل.
- ٦- إن القيم الثقافية والفقر وغياب أدوار نموذجية وسلوك الحكومة السليبي تجاه تمكين المرأة وانعدام قوة اتخاذ القرار ومحدودية الحركة هي بعض الأسباب الأخرى التي تقف وراء ما تواجهه أعداد من النساء في حقل العلوم والتكنولوجيا.

وهناك حلول لهذه المشكلات منها على سبيل المثال:

- إيجاد موارد خاصة لتعليم النساء وفتح المدارس والكليات وأن كان ذلك حتى في المديرية الصغيرة والقرى ويجب إدراج تدريس المواضيع الأخرى كمواضيع دراسات النوع الاجتماعي والعلوم المتطورة .. الخ ابتداء من المستويات الصغرى.

- التصدي لانتهاك حقوق الزواج وذلك بالتنديد بالزواج المبكر.
- غرس القدرات القيادية القوية في المرأة حتى تستطيع اتخاذ القرار المتعلق بحياتها وتشارك بنشاط في الأمور السياسية فتتال نصيبا من القدرة على العمل من أجل المجتمع عموما والمحرومات في المجتمع على وجه الخصوص.
- تعليم الأميات طريقة ممارسة إدارة أسرهن وأطفالهن وزيادة مهارتهن في الاتصال والعلم والحاجة إلى إدراك قيمتهن في مجال العلوم والتكنولوجيا.
- وأخيرا وليس آخرا فيما يتعلق بالتحرش الجنسي يجب إلزام الحكومات بتطبيق قانون السلوك في جميع مواقع العمل ضد المسائل المتعلقة بالتحرش الجنسي كما يجب تمكين المرأة بما فيه الكفاية من التعامل مع القضايا بكفاءة وذلك من خلال تنظيم ورش عمل وحلقات دراسية للنساء العاملات في المجتمع.